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ABSTRACT

For more than 75 years, the National Council of Teachers of Mathematics (NCTM) has been dedicated to improving the teaching and learning of mathematics. NCTM provides professional development opportunities through annual, regional, and leadership conferences and publishes journals, books, videos, and software. This handbook offers information about NCTM, the "NCTM Standards," NCTM goals, leaders, position statements, officers, conference dates, phone numbers and e-mail addresses for contacting the organization. (ASK)

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ED 421 343

National Council of Teachers of Mathematics

1997–98 Handbook

NCTM Goals, Leaders, and Position Statements

J. Carpenter

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Handbook design by Kristina Currin

The National Council of Teachers of Mathematics

For more than 75 years, the National Council of Teachers of Mathematics (NCTM) has been dedicated to improving the teaching and learning of mathematics. It is a recognized leader in efforts to ensure an excellent mathematics education for all students and an opportunity for every mathematics teacher to grow professionally.

With more than 110 000 members, NCTM is the largest nonprofit professional association of mathematics educators in the world. NCTM offers vision, leadership, and avenues of communication for mathematics educators at the elementary school, middle school, high school, and college and university levels.

NCTM provides professional development opportunities through annual, regional, and leadership conferences and publishes journals, books, videos, and software.

As a professional association, NCTM derives its strength from its members, who are drawn from the broad community of stakeholders in the field of mathematics and mathematics education. Members participate in the work of approximately seventy national committees and task forces and contribute to all aspects of the Council's work.

NCTM at a Glance

- Founded in 1920, the National Council of Teachers of Mathematics is dedicated to improving mathematics teaching and learning from preschool through postsecondary school.
- With more than 110 000 members and 260 Affiliated Groups throughout the United States and Canada, NCTM is the world's largest mathematics education organization.
- NCTM's three *Standards* documents laid the foundation for excellence in mathematics education:

  The *Curriculum and Evaluation Standards for School Mathematics* (1989) presents recommendations for improving and updating the mathematics curriculum and the evaluation of students' achievement.

  The *Professional Standards for Teaching Mathematics* (1991) offers specific suggestions for how mathematics teachers can create successful learning environments for every student and promote their own professional growth.

  The *Assessment Standards for School Mathematics* (1995) describes ways to have a comprehensive mathematics assessment program and provides criteria for judging the quality of mathematics assessment.
- NCTM's Addenda Series brings the message of the *Standards* documents to the classroom. This 22-book series includes suggestions for classroom activities, for the evaluation of students' skills, and for technology uses that teachers can consider in planning their lessons.
- NCTM publishes four professional journals—*Teaching Children Mathematics, Mathematics Teaching in the Middle School,* the *Mathematics Teacher,* and the *Journal for Research in Mathematics Education*—along with the *NCTM News Bulletin* and more than 250 educational books, videos, and other materials.
- NCTM's Mathematics Education Trust (MET) provides funds directly to teachers to enhance the mathematics education provided to all students. MET offers seven grant and scholarship programs and one lifetime achievement award program.
- The Council holds an annual meeting and eight to ten regional meetings each year, at which teachers of mathematics and others interested in mathematics education can attend lectures, panel discussions, and workshops and can see exhibits of the latest mathematics education materials and innovations.
- NCTM sponsors annual events, such as Mathematics Education Month and the World's Largest Math Event, that promote the value of mathematics.
- NCTM's World Wide Web site, www.nctm.org, offers information about NCTM and its programs, publications, and professional development opportunities.
- NCTM's Fax on Demand service, (800) 220-8483, provides around-the-clock access to NCTM documents and information.

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Questions and Answers

Answers to Questions about Mathematics Education

Improving the teaching and learning of mathematics has been a slow and uneven process. But each year we see signs of progress in schools where the National Council of Teachers of Mathematics (NCTM) *Standards* are used as a guide. Students' scores are up. More students are taking—and succeeding in—higher-level mathematics programs. More students are mastering mathematical skills. And more students are gaining the mathematical understanding they need to carry forth to the twenty-first century.

But the road to change is rugged and full of twists and turns. The questions that arise about where we are going and why we are going there are good ones. Answering them helps us check our course and renew our determination. You may have questions yourself, or you may like to have better answers to questions from your students' parents, your colleagues and administrators, and even business, political, and community leaders. So below are some questions and answers—your road map—that might help explain the journey we've undertaken to improve mathematics education.

Q Why change mathematics education?

A Because our mathematics needs have changed. Over the past decades, we have seen changes in mathematics and its uses, changes in the role of technology, changes in the needs of society, changes in international competitiveness, and changes in what we know about how students learn. In this new world, we need to redefine the way we prepare our children to understand and use the power of mathematics.

Q What are the NCTM *Standards*?

A The NCTM's *Curriculum and Evaluation Standards for School Mathematics* (1989), *Professional Standards for Teaching Mathematics* (1991), *and Assessment Standards for School Mathematics* (1995) are guidelines for excellence in mathematics education. They make recommendations about what mathematics students should learn, what classroom practice should be, and what guidelines can be used to judge student performance and evaluate the effectiveness of mathematics programs. The NCTM *Standards* envision rich mathematics opportunities and high achievement for all children in all mathematics classrooms.

Q What changes do the NCTM *Standards* propose?

A The NCTM *Standards* reflect the importance that society places on reasoning and problem solving and research in how children learn. The *Standards* recommend strengthening mathematics teaching and learning by shifting practice in multiple areas:

- **Curriculum**—shifting toward a deeper study of mathematical concepts and a broader study of mathematical content areas, along with their uses in today's world
- **Learning**—shifting toward more active student involvement with mathematics and the use of a variety of appropriate mathematical tools for solving problems
- **Teaching**—shifting toward creating classrooms that are stimulating learning environments in which all students have the opportunity to reach their full mathematical potential
- **Assessment**—shifting toward assessment that is ongoing, continuous, and multifaceted

On what foundation are the NCTM *Standards* based?

The NCTM *Standards* are based on research and our increased knowledge about how children learn. For example,

- **Mathematics content**—the emerging views of the mathematics all students should know is based on such reports as *Renewing U.S. Mathematics*, *Mathematics in American Schools*, and *New Goals for School Mathematics*.
- **Student learning**—research on how students learn has been summarized in the chapters in *Handbook of Research on Mathematics Teaching and Learning* and the chapter on mathematics in *Handbook of Educational Psychology*.
- **Teaching methods**—research on the benefits derived when teachers emphasize lessons designed to promote student understanding, conducted by the Center for Research on Teaching, are discussed in the *Handbook of Research on Mathematics Teaching and Learning*.
- **Assessment**—research that supports the shift in assessment—from a measurement approach developed to compare students on the basis of their answers to a set of brief questions toward a performance-criteria approach designed to determine growth in each student's ability to solve nonroutine problems—is summarized in *Toward a New Science of Educational Testing and Assessment*, *Mathematics Assessment and Evaluation: Imperatives for Mathematics Education*, and *Reform in School Mathematics and Authentic Assessment*.

As projects based on the NCTM *Standards* evolve, data are being collected showing the positive effects on students' achievement.

(A more complete description of this research may be obtained from the NCTM Headquarters Office—NCTM, Infocentral, 1906 Association Drive, Reston, VA 20191-1593, or Fax on Demand, 800-220-8483, document #207.)

What should I see in a *Standards*-based mathematics classroom?

First and foremost, you'll see students doing mathematics. But you'll see more than just students completing worksheets. You'll see students interact with one another, use other resources along with textbooks, apply mathematics to real-world problems, and develop strategies to solve complex problems.

Teachers still teach. The teacher will pose problems, ask questions that build on students' thinking, and encourage students to explore different solutions. The classroom will have various mathematical and technological tools (such as calculators, computers, and math manipulatives) available for students to use when appropriate. The teacher may move among the students to understand their thinking and how it is reflected in their work, often challenging them to engage in deeper mathematical thinking. The teacher will regularly encourage students to think carefully about the mathematics in one situation and make connections to other ideas within mathematics and other disciplines. The teacher will summarize the mathematics that has been studied and clarify the students' understanding of the mathematics in the lesson.

There are many models of *Standards*-based classrooms, but the focus will always be on students' learning and doing high-quality mathematics.

Do the NCTM *Standards* support teaching the "basics"?

Absolutely. The NCTM *Curriculum and Evaluation Standards for School Mathematics* clearly and unequivocally states that students should "model, explain, and develop reasonable proficiency with basic facts and algorithms" (p. 44). Computational proficiency has always been, and will continue to be, an integral part of mathematics education. Yet computational proficiency alone is not enough. To be successful in today's world, students need proficiency

with basic facts, and they must be adept in reasoning, in problem solving, and in communicating mathematics. They must also have the ability to make mathematical connections, and they must be able to use their computational skills to apply mathematics to problems in other disciplines.

What is the role of technology in a *Standards*-based classroom?

A

A comprehensive mathematics curriculum should help students learn to use calculators, computers, and other technological tools. These tools are used in many aspects of their education and influence how they study mathematics, science, or engineering in college or how they will do mathematics in the workplace. It would be remiss not to make their use a part of contemporary mathematics education.

The *Curriculum and Evaluation Standards for School Mathematics* makes it clear, however, that such tools "do not replace the need to learn basic facts, to compute mentally, or to do reasonable paper-and-pencil computation" (p. 19). The *Standards* also suggest that when used appropriately, calculators and computers enable students to explore new areas of mathematics and to tackle many challenging mathematical problems that are impractical to attempt without the aid of such tools. Indeed, calculators and computers with appropriate software can transform the classroom into a laboratory where students can investigate and experiment with mathematical ideas.

What is the role of textbooks in mathematics education?

A

This is one issue on which many people have misunderstood the position of the NCTM *Standards*. Every school should have a coherent, coordinated curriculum. A good mathematics textbook is almost always an essential element in implementing that curriculum.

The NCTM *Curriculum and Evaluation Standards for School Mathematics* stresses that the textbook should not be the exclusive source of knowledge (p. 129); rather, a textbook should be one of many resources available to students. A good textbook, in conjunction with other rich curriculum materials, will help the teacher emphasize important mathematical ideas and move beyond routine instruction on procedures and vocabulary to having students apply these mathematical ideas and use them to solve challenging problems.

What are the changes in assessment?

A

Teachers should not rely on paper-and-pencil tests and timed drills as their only means to judge students' performance because doing so will not provide a complete picture of most students' mathematical knowledge and ability. Students should be given ample opportunity to demonstrate their mathematical understanding through a variety of methods, including portfolios, discussions, presentations, and projects in addition to the traditional approach of written tests. This variety enables teachers to review, assess, and gauge students' progress.

How can we engage all students in mathematics?

A

The NCTM *Standards* issue a call for *all* students to engage in higher levels of mathematics. All students should have the same opportunities to learn the same mathematics. All students should have equal opportunities to use the same resources, including appropriate technology, to engage in mathematical thinking and reasoning and to become involved with tasks that are challenging and focused on good mathematics and that encourage further learning.

Why should parents become involved in improving mathematics education, and what role can they play?

A survey by *Money* magazine found that the amount of support received from parents and the community was the most important factor in academic excellence in the best school districts in the country. The importance of parent and community support should not be underestimated.

Parents should work with teachers to understand the mathematical goals for the classroom, how these goals will be measured, and the ways in which parents can further mathematical understanding at home. Parents can support their children's mathematics education by looking for ways to link mathematics to daily activities. By becoming active partners in the homework process, parents can increase students' confidence in their mathematics abilities and encourage students to value mathematics and to continue their learning.

What do U.S. business leaders have to say about the future of mathematics education?

U.S. business leaders recognize that what was traditionally known as shopkeeper's arithmetic is insufficient in the Information Age. They have repeatedly reported the need for employees who can think and communicate mathematically, who can solve problems, and who can work in teams as well as alone. *Strengthening Your Child's Academic Future*, published by the Education Excellence Partnership (a consortium of business and education organizations), states, "Unlike ten or fifteen years ago, we now live in a world of computers, Web sites, and international competition. In a number of other countries and American communities, academics are more rigorous and challenging, and their students graduate better prepared to compete in our increasingly complex world. In order for your child to succeed in school, at work and in the community, he or she will need more skills and knowledge than ever before." According to the Partnership, "raising academic standards will help your child succeed in today's increasingly competitive world." The NCTM *Standards* establish those high, rigorous standards for mathematics excellence.

Do the NCTM *Standards* represent a national curriculum?

No. The NCTM *Standards* are not a national curriculum; rather they provide a framework for teaching, learning, and assessing mathematics that can be used by states and local school districts to shape their own mathematics curriculum.

Conclusion

There have never been "good old days" for mathematics education. Today, many more students can and must attain a level of mathematics understanding traditionally reserved for only a few. That is why we must move forward in our efforts to ensure that all students receive a rigorous, high-quality education in mathematics.

For a complimentary copy of NCTM's *Mathematics Making a Living, Making a Life*, contact the NCTM Headquarters Office at (703) 620-9840, ext. 113, or send your request by e-mail to infocentral@nctm.org.

Mission and Goals

Mission

The mission of the National Council of Teachers of Mathematics is to provide vision and leadership in improving the teaching and learning of mathematics so that every student is ensured an equitable *Standards*-based mathematics education and every teacher of mathematics is ensured the opportunity to grow professionally.

Goals

Goal 1: To foster excellence in school mathematics curricula, instruction, and assessment

1.1 Develop, disseminate, monitor, and update standards for curriculum, instruction, and assessment in mathematics.

1.2 Develop and promote models of curricula, instruction, and assessment in mathematics.

1.3 Offer assistance to states, provinces, and local districts in developing curricula, instruction, and assessment consistent with the Standards.

1.4 Promote the integration of current technologies and other tools for learning into mathematics curricula, instruction, and assessment.

Goal 2: To create a climate throughout the Council that demonstrates respect for, and a valuing of, diversity

2.1 Continue efforts to achieve equity in mathematics education.

2.2 Appoint committees and task forces and nominate prospective Board members so as to reflect the diversity in the Council.

2.3 Ensure that publications of the Council reflect the diversity of the Council.

Goal 3: To stimulate students' interests, confidence, and learning in mathematics

3.1 Encourage and support student participation in extracurricular mathematics activities, such as clubs and field days.

3.2 Promote the involvement of communities, families, and caregivers, including counselors, in students' mathematical education.

3.3 Develop products that can be used directly with students to enhance their mathematical growth.

3.4 Help teachers capitalize on student diversity to enrich their students' mathematics experiences both in and outside the classroom.

Goal 4: To strengthen leadership in, and service to, mathematics education

4.1 Recruit potential leaders and provide and promote leadership opportunities in schools, in regions, and in the Council for teachers from diverse groups.

4.2 Improve communication among NCTM, its membership, and others in the mathematics education community.

4.3 Advocate the involvement of mathematics specialists and other teachers in the development and improvement of curricula, instruction, and assessment at all levels, pre–K through college.

Goal 5: To foster excellence in professional development throughout the preparation and the career of teachers of mathematics at all levels, pre–K through college

5.1 Develop, disseminate, monitor, and update standards for the professional development of teachers of mathematics.

5.2 Improve the preparation and post-baccalaureate education of mathematics teachers.

5.3 Improve the ongoing professional development of mathematics teachers.

5.4 Encourage adequate support for professional development programs for mathematics teachers.

5.5 Validate and disseminate models for effective professional development programs for mathematics teachers.

5.6 Identify, adapt, and disseminate appropriate professional development strategies used by other educational organizations.

5.7 Provide professional development through publications, meetings, and other means.

5.8 Form partnerships with Affiliated Groups to help meet the ongoing professional development needs of mathematics teachers in specific regions.

Goal 6: To encourage research and development in mathematics education

6.1 Encourage and support programs of research and policy studies in teaching and learning mathematics, professional development, curriculum, and assessment.

6.2 Facilitate the development and dissemination of a research base for mathematics education reform.

6.3 Catalyze needed research involving, or requiring interaction among, various groups interested in mathematics education.

6.4 Disseminate implications of mathematics education research particularly as it relates to the implementation of best practices in the classroom.

Goal 7: To identify and influence the forces of change affecting mathematics education

7.1 Develop strategies to predict and address the future in curricular and political areas affecting mathematics education.

7.2 Acknowledge and address issues of diversity in mathematics education.

7.3 Help political groups and administrators understand the complexity and cost of excellence in mathematics education.

7.4 Suggest appropriate forms of family and community involvement in, and support of, mathematics programs and teachers.

7.5 Promote the establishment and maintenance of sources of funding for mathematics education research and development, curriculum, instruction, assessment, and professional development.

Goal 8: To collaborate and communicate with groups having interests related to excellence in mathematics education

8.1 Participate in decision-making processes that affect mathematics education at the regional, national, and international levels.

8.2 Work with Affiliated Groups as partners to address issues in mathematics education at local, state or provincial, and national levels.

8.3 Identify services that should be provided by NCTM directly by NCTM in collaboration with other organizations, including Affiliated Groups, or by other organizations.

8.4 Foster collaboration with users of mathematics and with organizations involved in such areas as research, education, and the mathematical sciences.

8.5 Develop cooperative programs in mathematics education with businesses, industries, and private or public agencies.

8.6 Build communication networks and forums to share information about mathematics education reform.

8.7 Participate in discussions and activities related to education issues that affect mathematics education, such as inclusion, school-to-work, site-based management, and reform efforts in other disciplines. (February 1995)

NCTM's Mathematics Education Trust

Brighten the future ... Enhance your professional growth!

The Mathematics Education Trust (MET) is a foundation, established by the National Council of Teachers of Mathematics (NCTM), to support the improvement of mathematics instruction through grants or awards to individuals, to groups of individuals, or to schools. Members of the NCTM can nominate candidates for the Lifetime Achievement Awards. The other seven grants are awarded competitively from proposals submitted by individual applicants. For additional information or an application, call the NCTM at (703) 620-9840, ext. 113, or e-mail mhoover@nctm.org.

1998–99 applications must be received by 1 December 1997.
1999–2000 applications will be available 2 April 1998 and due 1 December 1998.

Awards Available

- **Lifetime Achievement Medals in Leadership, Teaching, and Service** are designed to honor NCTM members who have exhibited a lifetime of achievement. NCTM members who wish to nominate candidates should submit letters of recommendation to Department I at NCTM by 1 December 1997.
- **Clarence Olander Grants for In-Service Training** are given to elementary school staff. Up to two elementary schools are selected each year for awards of up to $2000 each.
- The **Dale Seymour Endowment Fund** provides up to $2000 scholarships to K–12 teachers for improving their mathematics background to provide in turn better mathematics instruction to their students.
- **Ernest Duncan Scholarships** of up to $1000 are granted to teachers working at the K–6 level to improve their own professional competence as classroom teachers of mathematics.
- The **Mary Dolciani Scholarships** of up to $1500 are granted to teachers working at the grades 7–12 level to improve their own professional competence as classroom teachers of mathematics.
- **Future Leaders Annual Meeting Scholarships (FLAMeS)** fund up to $1000 in travel, subsistence, and substitute teacher expenses for full-time K–12 teachers (for elementary, middle, and high school levels) who have never attended an NCTM annual meeting and who are NCTM members to attend the Washington, D.C., Annual Meeting in April 1998.
- Funded by the E. Glenadine Gibb Endowment Fund, **Implementing NCTM Standards in Your Own Classroom Awards** of up to $2000 are provided to teachers of grade K–12 to carry out a plan that implements some aspect of the NCTM Standards.
- Funded by Toyota Motor Sales, U.S.A. Inc., a maximum of 30 grants up to $10,000 each are awarded to K–12 teachers (or teacher teams) for innovative teaching projects. **Toyota's Investment in Mathematics Excellence (Toyota TIME)** projects incorporate creative ideas that require resources beyond those ordinarily available to teachers; grants are allocated over a two-year period.

Note: 1998–99 Toyota TIME applications will be accepted at NCTM until 9 January 1998. The 1999–2000 application process will be announced later in 1998.

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Officers, Directors, Committees, and Representatives

All terms begin 1 May and end at the conclusion of the annual meeting in the year indicated next to the name, except where a different date is specified.

Leadership

Terms begin at the conclusion of the annual meeting.

Officers

Gail F. Burrill, Hales Corners, Wis. (President, 1998)

Glenda Lappan, East Lansing, Mich. (President-Elect, 1998)

Linda P. Rosen, Reston, Va. (Executive Director)

Board of Directors

Has general supervision of the activities of the Council and makes all appointments not specifically delegated to the president.

Gail F. Burrill, Hales Corners, Wis., 1996–98 Chair, 1999

Glenda Lappan, East Lansing, Mich., 1998–2000 Chair, 2001

Jerry P. Becker, Carbondale, Ill., 1998

Peggy House, Marquette, Mich., 1998

Sandra M. Powers, Charleston, S.C., 1998

Zalman Usiskin, Chicago, Ill., 1998

Patricia F. Campbell, College Park, Md., 1999

Dwight A. Cooley, Fort Worth, Tex., 1999

Linda M. Gojak, Euclid, Ohio, 1999

Johnny W. Lott, Missoula, Mont., 1999

Ann Carlyle, Santa Barbara, Calif., 2000

Loring (Terry) Coes III, Wakefield, R.I., 2000

Richard Kopan, Calgary, Alta., 2000

Steven J. Leinwand, Middletown, Conn., 2000

Linda P. Rosen, Reston, Va.

Committees and Representatives

Executive Committee—Acts for the Board of Directors when the Board is not in session and serves the president in an advisory capacity. (Terms begin at the conclusion of the annual meeting.) **Gail F. Burrill,** Hales Corners, Wis., 1999 (1996–98 chair); **Jerry P. Becker,** Carbondale, Ill., 1998; **Peggy House,** Marquette, Mich., 1998; **Glenda Lappan,** East Lansing, Mich., 2001; **Sandra M. Powers,** Charleston, S.C., 1998; **Zalman Usiskin,** Chicago, Ill., 1998; **Linda P. Rosen,** Reston, Va.

External Funding Review Panel—Sets clear criteria for direct Council involvement in externally funded projects. **Jim Rubillo,** Willow Grove, Pa., 1997–98 (chair); **Ian de Groot,** N. Vancouver, B.C.; **Marjorie Enneking,** Portland, Oreg.; **Gail F. Burrill,** Hales Corners, Wis. (ex officio); **Linda P. Rosen,** Reston, Va. (staff liaison)

Nominations and Elections Committee—Nominates two persons for each elective position and recommends procedures for conducting the election. Region represented is listed in parentheses. **Katherine P. Layton** (Western), Pacific Palisades, Calif., 1997–98 election (1997–98 chair); **Gilbert Cuevas** (Southern), Miami, Fla., 1997–98 election; **David de Coste** (Canadian), Antigonish, N.S., 1997–98 election; **Jack Price** (Western), Newport Beach, Calif., 1997–98 election; **Miriam Clifford** (Central), Wauwatosa, Wis., 1997–98 and 1998–99 elections; **Howard C. Johnson** (Eastern), Syracuse, N.Y., 1997–98 and 1998–99 elections (1998–99 chair); **Leroy Sachs** (Central), Brentwood, Mo., 1997–98 and 1998–99 elections; **Gail F. Burrill** (Central), Hales Corners, Wis., 1998–99 and 1999–2000 elections; **Betty Phillips** (Central), East Lansing, Mich., 1997–98, 1998–99, and 1999–2000 elections; **Thomas D. Seidenberg** (Eastern), Exeter, N.H., 1997–98, 1998–99, and 1999–2000 elections; **Carole Brooks** (Western) Tucson, Ariz., 1998–99, 1999–2000, and 2000–01 elections; **Pat Wilson** (Southern) Athens, Ga., 1998–99, 1999–2000, and 2000–01 elections.

Policy and Planning Cluster

Committees in this cluster monitor, anticipate, inform, and recommend. They advise the Board of Directors on a wide range of topics and issues in mathematics education.

Committee for a Comprehensive Mathematics Education of Every Child—Assists the Council in implementing its goal for the comprehensive education of every child. **Martha Brown,** Fort Washington, Md., 1998 (cochair); **Charlene Morrow,** South Hadley, Mass., 1998 (cochair); **Zalman Usiskin,** Chicago, Ill., 1998 (Board liaison); **Duane Cooper,** College Park, Md., 1999; **Elda Lopez-Bolio,** Houston, Tex., 1999; **Terri Belcher,** Berkeley, Calif., 2000; **Frederick Uy,** Bayside, N.Y., 2000; **Marilyn L. Hala,** Reston, Va. (staff liaison)

Instructional Issues Advisory Committee—Advises the Board of Directors on current and emerging issues dealing with curriculum, methods of instruction, and evaluation of instruction. **Roger Day,** Normal, Ill., 1999 (chair); **Michael Link,** Des Moines, Iowa, 1998; **Nancy Vace,** Greensboro, N.C., 1998; **Johnny W. Lott,** Missoula, Mont., 1999 (Board liaison); **Zatoon Vania,** Thornhill, Ont., 1999; **Grace Kelemanik,** Boston, Mass., 2000; **Tari Querin,** Portland, Oreg., 2000; **W. Virginia Williams,** Reston, Va. (staff liaison)

Professional Development and Status Advisory Committee—Advises the Board of Directors on matters pertaining to the professional development and status of mathematics educators. **Lew Romagnano,** Louisville, Colo., 1999 (chair); **Ann Beyer,** Pinckney, Mich., 1998; **Jean Morrow,** Olathe, Kans., 1998; **Stephanie Williamson,** Baton Rouge, La., 1999; **Melva Greene,** Baltimore, Md., 2000; **Steven J. Leinwand,** Middletown, Conn., 2000 (Board liaison); **Douglas Smeltz,** Westerville, Ohio, 2000; **Marilyn L. Hala,** Reston, Va. (staff liaison)

Research Advisory Committee—Advises the Board of Directors on matters related to research and policies on research in mathematics education and teacher education. **Paul Cobb,** Nashville, Tenn., 1998 (chair); **Michaele F. Chappell,** Tampa, Fla., 1998; **Patricia F. Campbell,** College Park, Md., 1999 (Board liaison); **Steve Monk,** Cambridge, Mass., 1999; **Jacqueline Stewart,** Mason, Mich., 1999; **Jim Stigler,** Los Angeles, Calif., 1999; **Deborah Schifter,** Northampton, Mass., 2000; **W. Gary Martin,** Reston, Va. (staff liaison)

Publications Cluster

These committees set editorial policies and practices, attract new authors and reviewers, and coordinate focus-issue topics for the respective journals. They advise the Board on matters related to NCTM's journal, book, videotape, and software publishing efforts.

Educational Materials Committee—Advises the Board of Directors on matters dealing with the NCTM educational materials program. Reviews manuscripts and proposals; generates and monitors projects and proposals consistent with a balanced educational materials program; and monitors existing publications for continued relevance. **Eric Hart,** Kalamazoo, Mich., 1999 (chair); **Linda L. Levine,** Orlando, Fla., 1998; **Sanderson M. Smith,** Carpinteria, Calif., 1998; **Dwight A. Cooley,** Fort Worth, Tex., 1999 (Board liaison); **Cathy A. Wick,** Saint Cloud, Minn., 1999; **Buckley Johnson,** Wethersfield, Conn., 2000; **Verdrey Madzimoyo,** Newton, Mass., 2000; **Harry B. Tunis,** Reston, Va. (staff liaison); **Jean T. Carpenter,** Reston, Va. (staff liaison)

The Educational Materials Committee oversees the following related editorial panels:

a. ***Assessment Addenda Task Force***—**Bill Bush,** Lexington, Ky. (chair); **Charles Allen,** Pittsburgh, Pa.; **Florence Glanfield,** Edmonton, Alta.; **Anja Greer,** Exeter, N.H.; **Steve Leinwand,** Middletown, Conn.; **Jean Stenmark,** Point Richmond, Calif.

b. ***History of Mathematics Education***—**Jeremy Kilpatrick,** Athens, Ga. (cochair); **George M. A. Stanic,** Athens, Ga. (cochair); **Eileen**

Donoghue, New York, N.Y.; **Carolyn Kieran,** Montreal, Que.; **William J. Reese,** Madison, Wis.; **Zalman Usiskin,** Chicago, Ill.

Mathematically Promising Students—**Linda Sheffield,** Highland Heights, Ky. (chair); **Jennie Bennett,** Houston, Tex.; **George Bertsemi,** Terre Haute, Ind.; **Peggy House,** Marquette, Mich.; **Harvey Keanes,** Minneapolis, Minn.; **Rick Wertheimer,** Pittsburgh, Pa.

Mathematics in the Early Years—**Juanita Copley,** Cypress, Tex. (chair); **Bob Baltanz,** Baltimore, Md.; **Herb Ginsburg,** New York, N.Y.; **Yolanda Padron,** Houston, Tex.; **Sarah Sprinkel,** Orlando, Fla.; **Marianne Weber,** Chesterfield, Mo.

Middle School Mathematics—**Larry Leutzinger,** Cedar Falls, Iowa (chair); **Dan Dolan,** Cromwell, Conn.; **Robert Hamada,** Los Alamitos, Calif.; **Stephanie Smith,** Provo, Utah; **Kathy Vielhaber,** Saint Louis, Mo.

Multiculturalism Gender Series—**Walter Secada,** Madison, Wis. (general editor); **Carol A. Edwards,** Saint Louis, Mo. (editor—Asian); **Jerilyn Grignon,** Keshena, Wis. (editor—American Indian); **Judith L. Jacobs,** West Covina, Calif. (editor—Gender); **Luis Ortiz-Franco,** Ojai, Calif. (editor—Hispanic); **Marilyn L. Strutchens,** College Park, Md. (editor—African American)

Oral History—**James D. Gates,** Reston, Va. (chair); **Alan Foster,** Chicago, Ill.; **Shirley Frye,** Cave Creek, Ariz.; **Karen Dee Michalowicz,** Falls Church, Va.; **Alan Osborne,** Columbus, Ohio; **Kathleen P. Chapman,** Reston, Va. (staff liaison)

Yearbook Editors and Panels—**Margaret J. Kenney,** Chestnut Hill, Mass. (1986–1998 general editor); **Frances R. Curcio,** Staten Island, N.Y. (1986–2001 general editor)

1989 Yearbook, *The Teaching and Learning of Algorithms in School Mathematics*—**Lorna J. Morrow,** Aurora, Ont. (editor); **George W. Bright,** Greensboro, N.C.; **John Del Grande,** New Market, Ont.; **Francis (Skip) Fennell,** Westminster, Md.; **Jacquelyn S. Joyner,** Richmond, Va.

1990 Yearbook, *Developing Mathematical Reasoning, K–12*—**Lee V. Stiff,** Raleigh, N.C. (editor); **Michaele Chappell,** Tampa, Fla.; **James Landwehr,** Murray Hill, N.J.; **Peter Lax,** New York, N.Y.; **Alan H. Schoenfeld,** Berkeley, Calif.; **Linda Walker,** Tallahassee, Fla.

2000 Yearbook, *Learning Mathematics for a New Century*—**Maurice Burke,** Bozeman, Mont. (editor); **John A. Dosses,** Normal, Ill.; **Kimberley Girard,** Glasgow, Mont.; **Carolyn Mahoney,** San Marcos, Calif.; **Lee Zia,** Durham, N.C.

Journal for Research in Mathematics Education Editorial Panel—Establishes standards and procedures for the publication of the *Journal for Research in Mathematics Education* and associated monographs. Oversees the reviewing and editing of manuscripts and monitors manuscript flow. **Judith Sowder,** San Diego, Calif., 2000 (editor); **Neil A. Pateman,** Honolulu, Hawaii, 1999 (chair); **Douglas A. Grouws,** Iowa City, Iowa, 1997–1997 monograph editor; **Erna Yackel,** Hammond, Ind., 2000 (monograph editor); **Jerry P. Becker,** Carbondale, Ill., 1998 (Board liaison); **Jere Confrey,** Austin, Tex., 1998; **Edward A. Silver,** Pittsburgh, Pa., 1998; **William F. Tate,** Madison, Wis., 1998; **Laurie D. Edwards,** Santa Cruz, Calif., 1999; **Steven R. Williams,** Provo, Utah, 1999; **Graham A. Jones,** Normal, Ill., 2000; **Judit Moschkovich,** Menlo Park, Calif., 2000; **Annie Selden,** Cookeville, Tenn., 2000; **Diana V. Lambdin,** Bloomington, Ind. (Board Liaison); **Jean T. Carpenter,** Reston, Va. (Managing Editor); **Charles A. (Andy) Reeves,** Reston, Va. (staff liaison)

The three panels below are responsible for the policy, procedures, content and standards for the publication of their respective journals.

Mathematics Teacher Editorial Panel—**Virginia Horak,** Tucson, Ariz., 2000 (chair); **Walter Dodge,** Winnetka, Ill., 1998; **David Masunaga,** Honolulu, Hawaii, 2000; **Dorothy Doyle,** Durham, N.C., 1999; **Daniel M. Fendel,** San Francisco, Calif., 1998; **Loring (Terry) Coes III,** East Greenwich, R.I., 2000 (Board liaison); **Peter Flusser,** Salina, Kans., 2000; **Kimberley Girard,** Glasgow, Mont., 2000; **Joan C. Armistead,** Reston, Va. (staff liaison)

Mathematics Teaching in the Middle School Editorial Panel—**Mari Muri,** Cromwell, Conn., 1999 (chair); **C. Patrick Collier,** Cheyenne, Wyo., 1998; **Peggy House,** Marquette, Mich., 1999; **Suzanne Smith Austin,** Miami, Fla., 1999; **Tina Pateracke,** Mount Pleasant, S.C., 1999; **Dan Brutlag,** Mill Valley, Calif., 2000; **Eric Wood,** Delaware, Ont., 2000; **Kathleen P. Chapman,** Reston, Va. (staff liaison)

Teaching Children Mathematics Editorial Panel—**DeAnn Huinker,** Milwaukee, Wis., 1999 (chair); **Douglas Edge,** Toronto, Ont., 1998; **Jacqueline (Jacqui) Goodloe,** Tempe, Ariz., 1998; **Charles F. Geer,** Caldwell, Tex., 1999; **Lillian (Nordie) Deal,** Newark, N.J., 2000; **David Fuys,** Brockport, N.Y., 2000; **Richard Kopan,** Chicago, Ill., 2000; Board liaison—**Daniel H. Bresenbach,** Reston, Va. (staff liaison)

Services Cluster

The services committees address a wide range of issues, including membership and explore ways to schedule, plan, and improve offerings at meetings.

Conference Services Committee—Advises the Board on matters dealing with annual meetings, regional conferences, and conferences. Provides consultant services to annual meeting program and local arrangements committees. Assists in implementing NCTM's conventions and conferences. **Mary Hatfield,** Tempe, Ariz., 1998 (chair); **Bill Juraschek,** Denver, Colo., 2000 (co-chair); **Laurie Boswell,** Montvale, N.J., 1999; **Linda Gojak,** Dublin, Ohio, 1999 (Board liaison); **Rose Strahan,** Cincinnati, Ohio; **Richard P. Stucky,** Shoreline, Wash., 1999; **Mary Lou Kestell,** Fairfax, Va., 2000; **Sandra Murrell,** Memphis, Tenn., 2000; **Ken Sherrick,** Dublin, Ohio, 2000; **Betty C. Richardson,** Reston, Va. (staff liaison); **Mark J. Workman,** Reston, Va. (staff liaison)

The Conference Services Committee oversees the planning of the general conference program and includes the following:

- ***74th Annual Meeting, Washington, D.C.*** (24 sessions, 2000)—**Don Hastings,** Mission, Tex. (program chair); **Blanche Brownlee,** Silver Spring, Md. (local arrangements chair); **Tom Gurski,** Bowie, Md. (Maryland coordinator); **Vickie Inge,** Stafford, Va. (Virginia chair); **Darrel Williams,** Hanover, Md. (DC chair)
- ***75th Annual Meeting, San Francisco, Calif.*** (22 sessions, 2001)—**Ed Dickey,** Columbia, S.C. (program chair)
- Regional Conferences:
  1. ***Milwaukee, Wisconsin*** (23 sessions, 2000)—**John (Jack) C. Moyer,** Milwaukee, Wis. (program chair); **DeAnn Huinker,** Milwaukee, Wis. (program coordinator); **Connie Laughlin,** Milwaukee, Wis. (program coordinator)
  2. ***Anchorage, Alaska*** (15 sessions, 2000)—**Sandra Schott,** Anchorage, Alaska (program chair); **Lyle Sparrowgrove,** Anchorage, Alaska (program chair)
  3. ***Memphis, Tennessee*** (25 sessions, 2000)—**Cheryl Cleaves,** Memphis, Tenn. (program chair); **Margie Hobbs,** Memphis, Tenn. (program coordinator); **Lana Solomon,** Memphis, Tenn. (program coordinator)
  4. ***Cleveland, Ohio*** (24 sessions, 2000)—**Linda Gojak,** Dublin, Ohio (program chair); **William Hunt,** Strongsville, Ohio (program coordinator); **Adele Cohn,** Cleveland, Ohio (program coordinator)
  5. ***Long Island, New York*** (24 sessions, 2000)—**Joanne Grace Lobrano,** Syosset, N.Y. (program chair); **Eva J. Bowen,** Babylon, N.Y. (program coordinator); **Nicholas J. Rescnick,** Hauppauge, N.Y. (program coordinator); **Barbara A. Tallman,** Farmingdale, N.Y. (program coordinator)
  6. ***Saint Louis, Missouri*** (24 sessions, 2000)—**Nancy L. Cooley,** Charlotte, Mo. (program chair); **Thomas "Chip" Dee,** Florissant, Mo. (program coordinator); **Carol A. Edwards,** Creve Coeur, Mo. (program coordinator)
  7. ***Dallas, Texas*** (25 sessions, 2000)—**Thomas E. Butts,** Tyler, Tex. (program chair); **Frances M. Thompson,** Dallas, Tex. (program chair)

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8. ***Denver, Colorado,*** 19–21 February 1998—**Christine Comins,** Pueblo, Colo. (conference chair); **Janeane Golliher,** Longmont, Colo. (program cochair); **Jodene Kissler,** Castle Rock, Colo. (program cochair)

9. ***Tampa, Florida,*** 5–7 March 1998—**Albert Soriano,** Tampa, Fla. (conference cochair); **Jack Keller,** Tampa, Fla. (conference cochair); **Tana Levinson,** Tampa, Fla. (program chair)

10. ***Hartford, Connecticut,*** 15–17 October 1998—**Kenneth Sherrick,** Middletown, Conn. (conference chair); **Mari Muri,** Cromwell, Conn. (program cochair); **Dan Dolan,** Cromwell, Conn. (program cochair)

11. ***Louisville, Kentucky,*** 15–17 October 1998—**Allan Podbelsek,** Louisville, Ky. (conference cochair); **Ken Jones,** Louisville, Ky. (conference cochair); **Robert Ronau,** Louisville, Ky. (program cochair); **Karen Karp,** Louisville, Ky. (program cochair)

12. ***Calgary, Alberta,*** 23–24 October 1998—**George Ditto,** Calgary, Alta. (conference cochair); **Bob G. Michie,** Calgary, Alta. (conference cochair); **Cynthia Ballheim,** Calgary, Alta. (program cochair); **Richard Kopan,** Calgary, Alta. (program cochair)

13. ***Little Rock, Arkansas,*** 29–31 October 1998—**Linda K. Griffith,** Conway, Ark. (conference chair); **Shari Wilson Coston,** Hot Springs, Ark. (program chair)

14. ***Reno, Nevada,*** 11–13 November 1998—**James W. Brant,** Carson City, Nev. (conference chair); **Ruth E. Wilson,** Las Vegas, Nev. (program chair)

15. ***Charlotte, North Carolina,*** 4–6 February 1999—**Roger Bruhwel,** Charlotte, N.C. (conference chair); **Robert Kimball,** Raleigh, N.C. (program chair)

16. ***Des Moines, Iowa,*** 11–13 February 1999—**Rose M. Zbiek,** Iowa City, Iowa (conference cochair); **Susan Lynn Risius,** West Des Moines, Iowa (conference cochair); **Virginia Swenson,** Ames, Iowa (program cochair); **Brian A. Keller,** Ames, Iowa (program cochair)

17. ***Great Falls, Montana,*** 4–6 March 1999—**Terri L. Dahl,** Great Falls, Mont. (conference chair); **Richard Seitz,** Helena, Mont. (program chair)

18. ***Honolulu, Hawaii,*** 27–30 July 1999—**Jeanne Nelson,** Honolulu, Hawaii (conference cochair); **Jennie Thompson,** Waipahu, Hawaii (conference cochair); **Joseph T. Zilliox,** Honolulu, Hawaii (program cochair); **Neil A. Pateman,** Honolulu, Hawaii (program cochair)

19. ***Boise, Idaho,*** 7–9 October 1999—**Becky A. Compton,** Boise, Idaho (conference chair); **Beth A. Krantz,** Parma, Idaho (program chair)

20. ***Pittsburgh, Pennsylvania,*** 13–15 October 1999—**Thomas F. Sigmund,** Johnstown, Pa. (conference cochair); **Charles Fleming,** Pittsburgh, Pa. (conference cochair); **Joann Mullen,** Fairview, Pa. (program cochair); **Ann Noonan,** Edinboro, Pa. (program cochair)

21. ***Topeka, Kansas,*** 11–13 November 1999—**Richard T. Driver,** Topeka, Kans. (conference cochair); **Betsy Wiens,** Topeka, Kans. (conference cochair); **Connie S. Schrock,** Emporia, Kans. (program cochair); **Jean Morrow,** Olathe, Kans. (program cochair)

22. ***Phoenix, Arizona,*** 2–4 December 1999—**Karen A. Engelman,** Tempe, Ariz. (conference chair); **Rita J. Hartman,** Tucson, Ariz. (program chair)

23. ***El Paso, Texas,*** 27–29 January 2000—**Vodene N. Schultz,** El Paso, Tex. (conference chair); **Alicia Torres,** El Paso, Tex. (program chair)

24. ***Mobile, Alabama,*** 16–18 March 2000—**Elizabeth Evans,** Mobile, Ala. (conference chair); **C. J. Daane,** Tuscaloosa, Ala. (program cochair); **Tommy G. Smith,** Birmingham, Ala. (program cochair)

25. ***Halifax, Nova Scotia,*** 20–22 July 2000—**Richard S. MacKinnon,** Halifax, N.S. (conference chair); **David M. DeCoste,** Antigonish, N.S. (program chair)

– Tentative Date

External Relations Committee—Plans ways to communicate and promote NCTM to wider audiences. **Tony Spears,** San Diego, Calif. (chair); **Gail F. Burrill,** Hales Corners, Wis. (Board liaison); **Mary Delagardelle,** Ames, Iowa; **Alice Gill,** Washington, D.C.; **James Landwehr,** Summit, N.J.; **William James Lewis,** Lincoln, Nebr.; **Helen Purks,** Columbus, Ga.; **Kay Sammons,** Columbia, Md.; **Steven Viktora,** Wilmette, Ill.; **L. Eileen Erickson,** Reston, Va. (staff liaison)

Member Services Committee—Recommends and monitors NCTM services that pertain directly to members. **Martha Wallace,** Londsdale, Minn. (chair); **Yvonne Comer-Holbrook,** Pittsburgh, Pa.; **Sally Fischbeck,** Clifford, Pa.; **William J. Hunt,** Strongsville, Ohio; **Glenda Lappan,** East Lansing, Mich. (Board liaison); **Thomas Nuttall,** Centreville, Va.; **Virginia Thompson,** El Cerrito, Calif.; **Cynthia C. Rosso,** Reston, Va. (staff liaison)

Regional Services Committee—Maintains liaison between NCTM Affiliated Groups and the Board of Directors. Provides assistance to Affiliated Groups. **Janie Zimmer,** Sykesville, Md., 1998 (chair); **Cindy Boyd** (Southern 2), Abilene, Tex., 1998; **Carolyn Gould** (Canadian 1), Saint Lambert, Que., 1998; **Stephen F. West** (Eastern 1), Livonia, N.Y., 1998; **Nancy J. Zimney** (Central 2), Grand Forks, N.D., 1998; **John J. Brady III** (Southern 1), Nashville, Tenn., 1999; **Carlos Cabana** (Western 2), Oakland, Calif., 1999; **Ivan Johnson** (Canadian 2), Whistler, B.C., 1999; **Sherry G. Bailey** (Southern 4), Columbia, S.C., 2000; **James F. Bohan** (Eastern 2), Lancaster, Pa., 2000; **Mary Buck** (Western 1), Cascade, Mont., 2000; **Ann Carlyle** (Affiliates-at-Large), Goleta, Calif., 2000 (Board liaison); **Randy Pippen** (Central 1), Lisle, Ill., 2000; **Clementine Sherman** (Southern 3), Pembroke Pines, Fla., 2000; **Nancy Hawthorne,** Reston, Va. (staff liaison); **Barbara J. Thode,** Reston, Va. (staff liaison)

Student Services Committee—Designs and monitors mathematics services for grades K–12 students. **Mark Saul,** New York, N.Y. (chair); **Heidi A. Aranda,** Tucson, Ariz.; **Roy L. Barnes,** Pine Bluff, Ark.; **Charles L. Hamberg,** Aurora, Ill.; **Linda T. Inlay,** Yountville, Calif.; **David C. Kelly,** Granby, Mass.; **Sandra M. Powers,** Charleston, S.C. (Board liaison); **Barbara I. Stott,** Metairie, La.; **Joan C. Armistead,** Reston, Va. (staff liaison)

The Student Services Committee oversees the following:

a. **Student Math Notes *Editorial Panel*—Charles L. Hamberg,** Aurora, Ill., 1998 (chair); **Rodney V. De Jarnett,** Concord, N.H., 1998; **Sandra M. Powers,** Charleston, S.C., 1998 (Board liaison); **David S. Daniels,** Longmeadow, Mass., 1999; **Sheryl Yamada,** Beverly Hills, Calif., 2000; **Joan C. Armistead,** Reston, Va. (staff liaison)

b. ***World's Largest Math Event 4 Committee*—Melfried Olson,** Macomb, Ill. (chair); **Connie Laughlin,** Muskego, Wis.; **Jane Martain,** Brighton, Utah; **Roy Barnes,** Pine Bluff, Ark. (Student Services Committee liaison); **Daniel Brahier,** Bowling Green, Ohio (materials developer); **Daniel H. Breidenbach,** Reston, Va. (staff liaison); **Charles A. (Andy) Reeves,** Reston, Va. (staff liaison)

Other Committees and Task Forces

Advisory Committee for Recognizing and Recording Reform in Mathematics Project—**Mary M. Lindquist,** Columbus, Ga. (chair); **Joan Ferrini-Mundy,** McLean, Va. (project director); **Linda Levine,** Orlando, Fla.; **Douglas B. McLeod,** Pullman, Wash.; **Linda P. Rosen,** Reston, Va.; **Edward Silver,** Pittsburgh, Pa.; **Donald M. Stewart,** New York, N.Y.; **Marilyn L. Hala,** Reston, Va. (staff liaison)

MATHCOUNTS Question Writing Committee—**Judy A. White,** Littleton, Mass. (chair); **Ron Elgin,** Grand Forks, N.D. (1999, 2000, and 2001 exams); **Carol Findell,** Boston, Mass. (1999 exam); **Julie Fisher,** Ypsilanti, Mich. (1999, 2000, and 2001 exams); **William Leschensky,** Custer, S.D. (1999 exam); **Howard Selbst** (2000, 2001, 2002 exams); **Rachel Newman-Turner,** Baltimore, Md. (2000, 2001, and 2002 exams)

Mathematics Education Trust Committee—**Bob D. Robinson,** Mukilteo, Wash., 1998 (chair); **Beverly W. Nichols,** Overland Park, Kans., 1999; **Donald L. Chambers,** Madison, Wis., 2000; **Claudia Carter,** Columbus, Miss., 2001; **Linda P. Rosen,** Reston, Va. (staff liaison)

NCATE Guidelines Task Force—**Jean Morrow,** Olathe, Kans. (chair); **Tom Bishop,** Jonesboro, Ark.; **Michael Fiske,** Saint Cloud, Minn.; **Gladys Sanders,** Lawrence, Kans.; **Connie Widmer,** Highland Heights, Ky.; **Marilyn L. Hala,** Reston, Va. (staff liaison)

Commission on the Future of the Standards—**Mary M. Lindquist,** Columbus, Ga. (chair); **Fred Crouse,** Centreville, N.S.; **Portia C. Elliott,** Amherst, Mass.; **Mazie Jenkins,** Madison, Wis.; **Jeremy Kilpatrick,** Athens, Ga.; **Michael Koehler,** Kansas City, Mo.; **James R. Leitzel,** Durham, N.H.; **Marilyn E. Mays,** Irving, Tex.; **Richard Schoen,** Stanford, Calif.; **Bonnie Walker,** Houston, Tex.; **Gail F. Burrill,** Hales Corners, Wis. (ex officio); **Jack Price,** Newport Beach, Calif. (ex officio); **Linda P. Rosen,** Reston, Va. (ex officio); **W. Gary Martin,** Reston, Va. (staff liaison)

a. ***Standards 2000 Writing Groups***—**Joan Ferrini-Mundy,** McLean, Va. (chair); **W. Gary Martin,** Reston, Va. (staff liaison)

- ***Grades Pre-K–2:*** **Jeane Joyner,** Raleigh, N.C. (chair); **Angela Andrews,** Lisle, Ill.; **Doug Clements,** Williamsville, N.Y.; **Alfinio Flores,** Tempe, Ariz.; **Carol Midgett,** Southport, N.C.; **Judy Roitman,** Lawrence, Kans.
- ***Grades 3–5:*** **Barbara Reys,** Columbia, Mo. (chair); **Francis (Skip) Fennell,** Westminster, Md.; **Catherine Fueglein,** Saint Louis, Mo.; **Melissa Manzano,** Fort Worth, Tex.; **Susan Jo Russell,** Somerville, Mass.; **Phil Wagreich,** Chicago, Ill.
- ***Grades 6–8:*** **Ed Silver,** Pittsburgh, Pa. (chair); **Mary Bouck,** Portland, Mich.; **Jean Howard,** Helena, Mont.; **Diana Lambdin,** Bloomington, Ind.; **Carol Malloy,** Durham, N.C.; **Jim Sandefur,** Washington, D.C.
- ***Grades 9–12+:*** **Alan Schoenfeld,** Berkeley, Calif. (chair); **Sue Eddins,** Batavia, Ill.; **Millie Johnson,** Bellingham, Wash.; **Ron Lancaster,** Hamilton, Ont.; **Al Manaster,** La Jolla, Calif.; **Milton Norman,** Virginia Beach, Va.

b. ***Standards 2000 Electronic Format Group***—**Enrique Galindo,** Bloomington, Ind. (chair); **Tom Garski,** Baltimore, Md.; **Beverly Hunter,** Cambridge, Mass.; **Eugene Klotz,** Swarthmore, Pa.; **Nanette Seago,** Riverside, Calif.; **W. Gary Martin,** Reston, Va. (staff liaison)

Curriculum Review Task Force—**Jerry Johnson,** Bellingham, Wash. (chair); **Ed Barbeau,** Toronto, Ont.; **Beatriz D'Ambrosio,** Indianapolis, Ind.; **Kay Guilliland,** San Jose, Calif.; **Bill Stiggers,** Shaker Heights, Ohio; **Daniel H. Breidenbach,** Reston, Va. (staff liaison)

Electronic Resources Committee—**Eugene Klotz,** Swarthmore, Pa., 2000 (chair); **Chris Dede,** Arlington, Va., 2000; **Chuck Friesen,** Lincoln, Neb., 2000; **Bonnie Hagelberger,** Minneapolis, Minn., 2000; **Dorothy Keane,** Monrovia, Calif., 2000; **Joe Kmoch,** Milwaukee, Wis., 2000; **Harry B. Tunis,** Reston, Va. (staff liaison)

New Publications Task Force—**Zalman Usiskin,** Chicago, Ill. (chair); **Cynthia Ballheim,** Calgary, Alta.; **Peggy House,** Marquette, Mich.; **Johnny W. Lott,** Missoula, Mont.; **Barbara Marshall,** Philadelphia, Pa.; **Hung-Hsi Wu,** Berkeley, Calif.; **Charles A. (Andy) Reeves,** Reston, Va. (staff liaison)

Task Force on Mathematics Teaching and Learning in Poor Communities—**David Molina,** Austin, Tex. (chair); **Richard D. Anderson,** Baton Rouge, La.; **Patricia F. Campbell,** College Park, Md. (Board liaison); **Ruth Cossey,** Oakland, Calif.; **Joan L. Grampp,** Waukesha, Wis.; **Wimberly Royster,** Lexington, Ky.; **Ed Silver,** Pittsburgh, Pa.; **W. Gary Martin,** Reston, Va. (staff liaison)

Representatives

1. ***Alliance for Curriculum Reform***—**Jack Price,** Newport Beach, Calif., 1998
2. ***American Association for the Advancement of Science***—**James T. Fey,** Wheaton, Md. (Section A, Mathematics), February 1998; **Jack Price,** Newport Beach, Calif. (Section Q, Education), February 1998
3. ***American Mathematics Competitions***—**Mary Jo Messenger,** Columbia, Md., April 1999; **Joyce Hawkins,** Hallandale, Fla., April 2000
4. ***AMS MAA Joint Committee on Research in Undergraduate Mathematics***—**Joan Ferrini-Mundy,** McLean, Va., 1999
5. ***AMS MAA SIAM NCTM IMS ASA AWM Joint Committee on Women in the Mathematical Sciences***—**Ena Cross,** Richmond, Va., April 1999
6. ***American Statistical Association NCTM Joint Committee on the Curriculum in Statistics and Probability***—**Gretchen Davis,** Santa Monica, Calif., December 1997; **Maria Mastromatteo,** Ravenna, Ohio, December 1998; **Mike Shaughnessy,** Portland, Oreg., December 1999
7. ***Conference Board of the Mathematical Sciences***—**Gail F. Burrill,** Hales Corners, Wis., April 1998
8. ***Council of Scientific Society Presidents***—**Gail F. Burrill,** Hales Corners, Wis., April 1998
9. ***Educational Resources Information Center—Mathematics Education***—**Grayson Wheatley,** Tallahassee, Fla., 1998
10. ***Eisenhower National Clearinghouse Board***—**Harry B. Tunis,** Reston, Va., 2000
11. ***Eisenhower National Clearinghouse Steering Committee***—**James D. Gates,** Reston, Va.
12. ***International Mathematics Education***—**Frances R. Curcio,** Staten Island, N.Y., April 1999
13. ***Junior Engineering Technical Society***—**James D. Gates,** Reston, Va., June 1998
14. ***MATHCOUNTS Foundation Board***—**Joan C. Armistead,** Reston, Va., 1999; **James D. Gates,** Reston, Va., 1999
15. ***Mu Alpha Theta***—**Mary Rhein,** Mainville, Ohio, April 2000
16. ***National Advisory Council of the Eandy Technology Scholars***—**Linda P. Rosen,** Reston, Va.
17. ***National Assessment of Educational Progress***—**John A. Dossey,** Eureka, Ill., 1999
18. ***National Council for Accreditation of Teacher Education***—**Genevieve M. Knight,** Columbia, Md., June 1998
19. ***New Standards Task Force***—**Diane J. Briars,** Pittsburgh, Pa., 1998
20. ***U.S. National Commission on Mathematical Instruction***—**Frances R. Curcio,** Staten Island, N.Y., December 1997; **Zalman Usiskin,** Chicago, Ill., December 1998

NCTM Affiliated Group Officers

Affiliated Groups (AGs) of the National Council of Teachers of Mathematics are groups whose purposes are consistent with NCTM's mission, goals, and objectives. As a larger, national organization, NCTM offers affiliates a broad perspective and a wide range of professional development opportunities. In turn, NCTM draws much of its strength from the work of its Affiliated Groups.

For educators, Affiliated Groups provide an opportunity to grow professionally and plan activities with other teachers in their district, city, or state. Locally, AGs offer their communities a rich resource of expertise in mathematics education.

There are more than 260 Affiliated Groups throughout the United States, its territories, Canada, and Europe. Membership sizes range from 25 individuals to 12,000 (see map on p. 23). While most AGs are organized by geographic area, some groups (called Affiliates-at-Large) organize internationally around a specific topic in mathematics education. For this reason, many teachers belong to several AGs as well as NCTM.

AGs are an integral part of NCTM and have many services available to them through the Council and the NCTM Regional Services Committee (RSC). Additionally, AGs are eligible to send representatives to the Delegate Assembly held each year in conjunction with the NCTM annual meeting. Information on becoming an Affiliated Group is available through the RSC or the Council's Headquarters Office.

AG officers sometimes change throughout the year. Check NCTM's Web site, www.nctm.org, for regular updates, including Web links (when available) to the information below. Each AG listing that follows includes a contact address for additional information. Please direct other questions regarding AGs to Affiliated Group Services at (703) 620-9840, ext. 104, or e-mail ag_info@nctm.org.

Affiliates-at-Large

Association of State Supervisors of Mathematics
(1) Mari Muri, Cromwell, Conn.; (2) *Barbara Montalto, 9902 Talleyran Drive, Austin, TX 78730; (3) Patricia Wright, Richmond, Va.; (4) Bill Scott, Raleigh, N.C.

Benjamin Banneker Association
(1) Carol E. Malloy, Durham, N.C.; (2) *Linda B. Brummitt, 19475 Prairie, Detroit, MI 48221; (3) Martin Johnson, College Park, Md.; (4) William Leonard, Fresno, Calif.

Council for Logo and Technology in Mathematics Education
(1) Ken Lloyd, Scranton, Pa.; (2,3) Thor Chartschak, 10 Bogert Avenue, White Plains, NY 10606; (4) Robert Berkman, Brooklyn, N.Y.

Council of Presidential Awardees in Mathematics
(1) *William E. Hunt, 16734 Hamilton Court, Strongsville, OH 44136-5701; (2) Julianne Compton, Philadelphia, Pa.; (3) Susan E. Craig, Augusta, Ga.; (4) Kathleen Goto, Honolulu, Hawaii

European Council of Teachers of Mathematics
(1,2) *Diane Schmellhammer, PSC 2, Box 8418, APO, AE 09012; (3) Kristi Johnson, APO, AE; (4) Grady Zimmer, APO, AE

International Study Group on Ethnomathematics
(1) Ubiratan D'Ambrosio, Sao Paulo, Brazil; (2) *Lawrence Shirley, 834 Bosley Avenue, Towson, MD 21204-2610; (3) James Barta, Logan, Utah; (4) Patrick Scott, Albuquerque, N.M.

International Study Group on the Relations Between History and Pedagogy of Mathematics (Americas Section)
(1) Victor Katz, Washington, D.C.; (2,3) *Karen Dee Michalowicz, 5855 Glen Forest Drive, Falls Church, VA 22041; (4) Gerard L. Buskes, University, Miss.

National Council of Supervisors of Mathematics
(1) Bonnie Walker, Houston, Tex.; (2) *Beryl Jackson, 647 North Pacca Street, Baltimore, MD 21201; (3) Lilane Koehn, Lombard, Ill.; (4) Vince O'Connor, Milwaukee, Wis.

Society of Elementary Presidential Awardees
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Position Statements

NCTM position statements define a particular problem, issue, or need and describe its relevance to mathematics education. Each statement defines the Council's position on the issue and suggests a course of action. The NCTM Board of Directors approves all position statements. The date in parentheses at the end of each position statement refers to the approval date.

Calculators and the Education of Youth

Calculators are widely used at home and in the workplace. Increased use of calculators in school will ensure that students' experiences in mathematics will match the realities of everyday life, develop their reasoning skills, and promote the understanding and application of mathematics. The National Council of Teachers of Mathematics therefore recommends the integration of the calculator into the school mathematics program at all grade levels in classwork, homework, and evaluation.

Instruction with calculators will extend the understanding of mathematics and will allow all students access to rich, problem-solving experiences. This instruction must develop students' ability to know how and when to use a calculator. Skill in estimation and the ability to decide if the solution to a problem is reasonable and essential adjuncts to the effective use of the calculator.

Evaluation must be in alignment with normal, everyday use of calculators in the classroom. Testing instruments that measure students' understanding of mathematics and its applications must include calculator use. As the availability of calculators increases and the technology improves, testing instruments and evaluation practices must be continually upgraded to reflect these changes.

The National Council of Teachers of Mathematics recommends that all students use calculators to—

- explore and experiment with mathematical ideas such as patterns, numerical and algebraic properties, and functions;
- develop and reinforce skills such as estimation, computation, graphing, and analyzing data;
- focus on problem-solving processes rather than the computations associated with problems;
- perform the tedious computations that often develop when working with real data in problem situations;
- gain access to mathematical ideas and experiences that go beyond those levels limited by traditional paper-and-pencil computation.

The National Council of Teachers of Mathematics also recommends that every mathematics teacher at every level promote the use of calculators to enhance mathematics instruction by—

- modeling the use of calculators in a variety of situations;
- using calculators in computation, problem solving, concept development, pattern recognition, data analysis, and graphing;
- incorporating the use of calculators in testing mathematical skills and concepts;
- keeping current with the state-of-the-art technology appropriate for the grade level being taught;
- exploring and developing new ways to use calculators to support instruction and assessment.

The National Council of Teachers of Mathematics further recommends that—

- school districts conduct staff development programs that enhance teachers' understanding of the use of appropriate state-of-the-art calculators in the classroom;
- teacher preparation institutions develop preservice and in-service programs that use a variety of calculators, including graphing calculators, at all levels of the curriculum;
- educators responsible for selecting curriculum materials make choices that reflect and support the use of calculators in the classroom;
- publishers, authors, and test and competition writers integrate the use of calculators at all levels of mathematics;
- mathematics educators inform students, parents, administrators, and school boards about the research that shows the advantages of including calculators as an everyday tool for the student of mathematics.

Research and experience have clearly demonstrated the potential of calculators to enhance students' learning in mathematics. The cognitive gain in number sense, conceptual development, and visualization can empower and motivate students to engage in true mathematical problem solving at a level previously denied to all but the most talented. The calculator is an essential tool for all students of mathematics. (February 1990)

Early Childhood Mathematics Education

The National Council of Teachers of Mathematics believes that early childhood mathematics education for young children (ages 3–8) should be developmentally appropriate. Developmentally appropriate instructional practices are those in which the mathematics learning environment takes into account the social, emotional, physical, and intellectual needs of young children. Since young children actively construct knowledge, instruction should concentrate on facilitating learning through exploration and interaction with materials and people. In early childhood mathematics, how and when the curriculum is taught is as important as what is taught. Thus, endorsing a developmental philosophy for early childhood mathematics education suggests reorganizing classroom practices around the total child rather than allowing materials and rigid time lines to dictate instruction. Furthermore, early childhood mathematics instruction should foster a positive environment, provide equal access for all children, and account for cultural and ethnic diversity.

Therefore, the National Council of Teachers of Mathematics recommends developmentally appropriate curriculum and evaluation guidelines for early childhood mathematics instruction that have the following aims:

- Acknowledge and build on children's accumulated knowledge by including children's experiences, language, and relevant real-world contexts.
- Incorporate active and interactive learning. Children's understandings develop as they explore, investigate, and

discuss mathematical concepts. Physical and mental interactions with the environment, materials, and other individuals give children opportunities to construct, modify, and integrate their ideas.

- Offer opportunities for children to develop and expand language acquisition while structuring, restructuring, and connecting mathematical understandings. Concepts should be repeatedly experienced through concrete, visual, verbal, and pictorial formats. Gradually, children should be encouraged to translate and record their experiences in more abstract representations.
- Be concept and problem solving oriented. The classroom environment should provide for the regular study of mathematics focusing on the development and integration of mathematical thinking, reasoning, understandings, and relationships through concrete problem solving experiences. Mathematical concepts should be integrated with other subject areas, making use of natural connections wherever they occur.
- Develop children's confidence in their mathematical abilities. Varied instructional strategies, meaningful child related contexts, and opportunities for active participation in the learning process encourage children to become capable mathematical thinkers and to believe in themselves as such.
- Include ongoing assessment. Teachers should make instructional decisions that are based on the progress of the children in their classroom. Children's progress is determined through information obtained from formal and informal assessment of each child's individual pattern of growth. Evaluation strategies such as observations, interviews, and portfolios give evidence of children's thinking processes and their understanding of concepts.

The National Council of Teachers of Mathematics recommends that those who produce, select, and purchase young children's mathematics curriculum materials support developmentally appropriate early childhood mathematics programs. Guidelines for early childhood mathematics education encourage a child-centered approach to instruction. Preference should be given to mathematical learning environments that support active participation where children learn through observation, exploration, verbalization, and hands-on experiences. The focus of instruction should be on the continuous development of mathematical processes and language through activities that gradually increase in difficulty, complexity, and challenge as children develop understanding and skills. Developmentally appropriate early childhood mathematics instruction should meet the needs of individual learners at different stages of readiness by considering the influences of cultural backgrounds, prior experiences, learning styles, and cognitive abilities. (Ephraim 1991)

Evaluation of Teacher Performance

Increasing demands for accountability have led state and provincial legislatures and agencies, school districts, professional organizations, and teacher education institutions to expand their efforts to evaluate a teacher's knowledge and performance. Although such evaluations are often used as a basis for decisions about admission to teacher education programs, eligibility for certificates, or advancement in the profession, the most important purpose of evaluation is to connect a teacher's current teaching with the professional development necessary to enable that teacher to improve the teaching of mathematics.

Evaluation includes the identification of goals by the teacher and the evaluators, the collection of information, and a collaborative dialogue between the teacher and the evaluators to formulate, redirect, and refine goals for the future. Goals for personal and professional growth may include some that are mandated by the state or province, district, teacher education institution, or individual school, but the teacher must be an active participant in identifying goals that improve instruction.

A comprehensive picture of both the performance and process for the evaluation of teaching is portrayed in the recently released *Standards for Teaching Mathematics* prepared by the National Council of Teachers of Mathematics in 1991. The process begins by collecting data representative of the teacher's current practice. Data should be gathered from various sources, such as self-assessment, observations, interviews, peer evaluations, teacher's portfolios, supervisors, and administrators.

The use that is made of the information gained through the evaluation process is as important as the act of assessment itself. The appropriate outcome of this ongoing process is a collaborative dialogue between the teacher and other participants in the process, resulting in a mutually agreed on plan for professional growth.

Although the process of evaluating the effective teacher may be applicable across subjects and grade levels, specific goals, criteria for observation, and resulting decisions must be directly related to the content of mathematics and appropriate teaching strategies.

The evaluation team should have a clear knowledge of the vision of teaching presented in the *Professional Standards for Teaching Mathematics* and rooted in the mathematical content and processes described in the *Curriculum and Evaluation Standards for School Mathematics*. The team should have specific expertise and experience in mathematics and the teaching of mathematics as well as in evaluation.

Therefore, the National Council of Teachers of Mathematics recommends that supervisors and administrators work closely with teachers to assure that the evaluation process is used to enhance the professional development of the teacher and increase the effectiveness of mathematics teaching. (Yost 1991)

Guiding Students' Attitudes and Decisions Regarding Their Mathematics Education

Educators, including parents, teachers, counselors, and administrators, are positioned to influence the formation of students' attitudes toward, and perceptions about, mathematics. These attitudes and perceptions are formed at an early age and reinforced by educators throughout the students' school years.

The following issues should be addressed at all levels:

- Equal access to the world of mathematics regardless of gender, ethnicity, or race
- The broad range of options available to students of mathematics
- That success in mathematics is more dependent on effort and opportunity to learn than on innate ability

For students to succeed in their study of mathematics they must believe that they can "do" mathematics and that it is worth "doing." Therefore, the National Council of Teachers of

Mathematics believes the following statements should characterize student programs:

Elementary School Level

Young children enter school having natural interest, curiosity, and an eagerness to learn. As children move through the elementary school level, educators build on these attitudes, which support children's mathematical development. By connecting mathematics with real-life experiences, educators can help children not only understand mathematics but see its value and usefulness.

Middle School Level

During the middle school years, students are experiencing the greatest changes in their development. It is during these years that educators must continue to provide encouragement to students and enable them to develop confidence in their ability to make sense of mathematics. A focal point for this age group is making connections between mathematics and their future options so that their academic and work-related choices are kept as broad as possible.

Secondary School Level

At the secondary school level, students should recognize the importance of the relationships between academic choices and career choices. It is essential that educators reinforce students' belief in the value of mathematics, in their ability to "do" mathematics now and in the future, and in their need to continually learn.

In addition, students should continually be provided reliable, up-to-date information on

- how what they are learning in mathematics relates to future options;
- the increasing number of career opportunities that are available as a consequence of further mathematical study;
- how careers in fields other than mathematics and the physical sciences are increasingly dependent on mathematical knowledge;
- their school's graduation requirements in mathematics;
- the entrance and graduation requirements in mathematics for vocational schools, technical schools, colleges, and universities.

Therefore, the NCTM recommends that all educators, including parents, teachers, counselors, and administrators, work together to shape, guide, and inform students' attitudes, perceptions, and decisions regarding their education in mathematics. (February 1984)

The Mathematics Education of Underrepresented Groups

The National Council of Teachers of Mathematics is committed to the principle that groups underrepresented in mathematics-based fields of study should be full participants in all aspects of mathematics education. These groups are composed of students who do not take advanced mathematics courses and do not enter mathematics-related vocations and careers in proportion to their representation in the population. The groups include females, African Americans, Hispanics, Native Americans, Alaskan Natives, and Native Pacific Islanders, among others.

Paths to continuing education and employment opportunities are often hindered by perverse social and institutional influences that discourage these students from studying mathematics. In our challenging and complex society, it is paramount that all students are considered valuable resources to be afforded the opportunity to reach their full potential and contribute to society.

Schools and districts should examine programs including assessment and instructional practices that may lead to mathematics avoidance. Mathematics educators must take an individual and collective commitment to eliminate any psychological and institutional barriers to the study of mathematics. Educators must explore and implement innovative ways to convince students and families from these groups of the vital importance of taking mathematics courses.

Teachers, administrators, and counselors at all educational levels should expect that students from all segments of the population will be successful in mathematics. The teacher is in a pivotal position to motivate and encourage all students to continue the study of mathematics.

All students must study a core curriculum in mathematics that reflects the spirit and the content of the NCTM *Standards*. The NCTM will continue to work to increase the participation and achievement of underrepresented groups in mathematics education. (April 1990)

Mathematics for Language Minority Students

Every student is entitled to a mathematics education that provides preparation for a full range of careers having mathematical prerequisites and to be an informed citizen. Cultural background and language must not be a barrier to full participation in mathematics programs.

Therefore, the National Council of Teachers of Mathematics makes the following recommendations:

- All students, regardless of their language or cultural background, must study a core curriculum in mathematics based on the NCTM *Standards*.
- Educators must identify and remove language-based barriers.
- Language-minority students must be given appropriate assistance in learning mathematics.
- Counselors and teachers must support and encourage students in continuing their mathematics education.
- The importance of mathematics and the nature of the mathematics program must be communicated to both students and parents.
- The mathematics curriculum must include connections to the cultural heritage of students.
- Teaching and assessment strategies must build upon the cultural heritage and learning styles of students.

To verify that barriers have been removed, educators must monitor enrollment and achievement data to determine whether language minority students have gained access to, and are succeeding in, core mathematics courses. Reviews must be conducted at district, state/provincial, and national levels. (September 1989)

Mathematics Leaders in Elementary/Middle Schools

A key component in the improvement of mathematics instruction for all students is greater attention to the elementary/middle

school mathematics program through the provision of stronger mathematics leadership at individual schools.

School mathematics leaders are essential for raising the level of mathematical knowledge and pedagogical competence of the staff, for coordinating mathematics instructional effort within and between buildings, and for helping to assure the implementation of a comprehensive, high-quality program. In addition, school mathematics leaders will support the roles and efforts of teachers, supervisors, and administrators who are increasingly concerned with promoting excellence for their students.

For these reasons, the National Council of Teachers of Mathematics advocates that every elementary/middle school identify a school mathematics leader to provide ongoing leadership and assistance in planning, implementing, and evaluating a comprehensive school mathematics program. School mathematics leaders should be available as a resource to all staff in the areas of curriculum design, professional development, teaching methodology, classroom management, selection of materials, and student assessment.

More specifically, school mathematics leaders may perform or assist in any, or all, of the following tasks connected with the essential instructional functions listed below:

1. *Curriculum Design*
   a) Provide leadership in the development of mathematics instructional programs to meet diverse student needs.
   b) Coordinate the implementation of a sound instructional scope and sequence for mathematics.
   c) Facilitate the review and revision of the curriculum.
   d) Integrate mathematics with other content areas.
2. *Curricular Content*
   a) Relate the content of state/provincial and local curriculum guidelines to the individual school's program.
   b) Present and interpret mathematics content to meet teachers' needs.
   c) Promote the importance of mathematics.
   d) Keep abreast of national, state/provincial, and local recommendations for updating and revising curricular content by participating in the activities of professional associations.
3. *Methodology and Materials*
   a) Acquaint teachers with successful and innovative strategies for classroom instruction through demonstration lessons and conferences.
   b) Consult with teachers in selecting and implementing activities that improve motivation and attitude toward mathematics.
   c) Review, and recommend for acquisition when appropriate, teaching materials, calculators, computer software, etc., and assist teachers in integrating them into the program.
4. *Assessment*
   a) Participate in the review and selection of means of assessment.
   b) Assist staff in designing and using classroom tests.
   c) Assist staff in interpreting and using test data and placing students in appropriate activities.
5. *Other Functions*
   a) Work with staff in determining needs and priorities for professional development.
   b) Assist teachers, on request, in self-evaluation activities.
   c) Plan and budget for the purchase of instructional materials.
   d) Maintain and promote effective communication among grades and schools and with parents, the community, and support personnel.
   e) Coordinate instruction between regular and special programs to meet individual student needs.
   f) Manage, schedule, and equip a mathematics laboratory or teacher resource room.
   g) Provide direct instruction, as appropriate, for individual students, mathematics teams, or special projects.

As defined, school mathematics leaders serve as an ongoing resource to teachers by demonstrating knowledge, competence, and leadership in mathematics education. Thus, they should know and understand mathematics substantially beyond that which they may be expected to teach, and they should have knowledge and competence in the methods and techniques appropriate for effectively teaching mathematics to elementary/middle school students. (March 1984)

Mathematics Leaders in Secondary Schools

Strong mathematics leadership in each school building is a significant factor in the improvement of secondary mathematics instruction. Leaders in school mathematics are essential for improving the mathematical knowledge and pedagogical competence of the staff, for providing information about mathematics instruction within the school and between the school and its feeder schools, and for assuring the implementation of a comprehensive, high-quality program. Such leaders give assistance and support to teachers and administrators in promoting excellence in mathematics for all students.

For these reasons, the National Council of Teachers of Mathematics recommends that every secondary school identify a mathematics leader, often called the department head, to provide ongoing leadership and assistance in planning, implementing, and evaluating a comprehensive mathematics program. The mathematics leader must have an in-depth understanding of mathematics and a thorough knowledge of, and competence in, effective teaching methodology, coupled with the ability to work well with others. Such a person would be available at the building level to provide leadership in matters concerning (a) curriculum, (b) methodology and materials, (c) student assessment, (d) professional development, and (e) procedural duties.

Specifically, the mathematics leader should provide leadership and assistance to teachers, principals, supervisors, and other administrators in the following ways:

1. *Curriculum*
   a) Fostering the development, implementation, evaluation, and updating of departmental goals and objectives.
   b) Coordinating the implementation of an effective instructional scope and sequence for mathematics.
   c) Contributing toward the development of course offerings to meet diverse student needs.

d) Facilitating the review and revision of curricula to incorporate new developments in mathematics education

e) Encouraging the integration of mathematics with other content areas

f) Providing curriculum articulation between schools and among grade levels

g) Assuring consistent standards among teachers and among courses

2. *Methodology and Materials*

a) Acquainting teachers with successful and innovative strategies for classroom instruction through demonstration lessons and conferences

b) Helping teachers select and implement activities that improve students' motivation and attitude toward mathematics

c) Facilitating the review and selection of textbooks

d) Making recommendations for the acquisition of teaching resources such as manipulative materials, calculators, computers, computer software, and other instructional media

3. *Student Assessment*

a) Participating in the review and selection of assessment techniques

b) Assisting teachers in the design and implementation of all forms of assessment

c) Helping teachers interpret and use assessment data

d) Working with the guidance staff to facilitate appropriate student placement

4. *Professional Development*

a) Encouraging teachers to pursue further study of the mathematical sciences

b) Providing information about innovative materials and teaching strategies recommended by the mathematics education community

c) Encouraging teachers to become participating members in professional mathematics organizations

d) Facilitating the attendance of teachers at professional meetings and conferences

e) Encouraging discussion of the professional literature in mathematics education and related fields

5. *Personnel Duties*

a) Orienting new teachers

b) Assisting substitute teachers and student teachers

c) Conducting departmental meetings

d) Participating in the development of the master schedule

e) Formulating the departmental budget

f) Participating in the recruitment and selection of mathematics teachers

g) Facilitating students' participation in competitions and special programs

For the mathematics leader to accomplish the expected tasks, it is recommended that school systems provide a monetary supplement, released time, sufficient support services, and the opportunity to participate in professional activities in mathematics education at the local, state/provincial, regional, and national levels. The school mathematics leader is a critical component of an effective mathematics instructional program. The need for strong leadership at the building level is not merely desirable, it is essential. (April 1988)

Metrication

Measurement is a common daily activity performed in all nations, and a knowledge of its concepts and skills is an important topic for all sectors of society. On an international level, the increased demand for a common language of measurement has been caused by the adoption of the metric system. The teaching of this system of measurement is not the sole responsibility of mathematics teachers, however; all teachers and administrators share the responsibility to prepare students for a world where the metric system of measurement prevails. Yet, many in education, including mathematics education, continue to ignore the teaching and learning of the metric system.

As a part of the mathematics program, metric education provides models for activities involving numeration, decimal concepts, and estimation. It serves as a link that joins measurement concepts and skills to other major topics in the school mathematics curriculum. Therefore, the National Council of Teachers of Mathematics supports the use of the metric system as an integral part of the mathematics curriculum at all levels of education and recommends that all educators assume responsibility for providing leadership and direction in metric education. (April 1990)

Professional Development of Teachers of Mathematics

Professional development in the complex context of school mathematics teaching is the open-ended process of teachers learning: learning mathematics and about mathematics learning about students and how they learn, individually and in the social setting of school, learning the craft of teaching. Against the backdrop provided by *Curriculum and Evaluation Standards for School Mathematics* (1989), *Professional Standards for Teaching Mathematics* (1991), and *Assessment Standards for School Mathematics* (1995), teacher professional development must also include learning new ways to support the development of mathematical power in all students. The National Council of Teachers of Mathematics asserts that teachers of mathematics must engage in professional development activities that support teacher learning along each of these dimensions throughout their careers, if the vision of classrooms outlined in its *Standards* documents is to be realized.

Professional development occurs in many ways. For example, teachers engage in professional development when they build their knowledge base and examine their own beliefs and assumptions through investigating and evaluating the curriculum materials, classroom structures and patterns of interactions with and among students, and varied means of student assessment. By solving the problems, managing the conflicts and dilemmas of practice in an era of reform, teachers construct their own professional development programs. The Council supports these efforts in a variety of ways, including the publication of professional journals and educational materials and sponsoring regional and national conferences.

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However, teachers should not be expected to bear the burden of professional development through their own individual work in isolation. Teachers must be provided with sustained opportunities to collaborate with colleagues, to share and critique ideas, to draw on the knowledge and perspectives of others, to assume a reflective and analytic stance within a professional community.

Teacher collaboration may take many forms. Within schools, teams of teachers might focus on the design of particular courses, on curriculum articulation across grade levels, or on testing new teaching strategies or technology. Collaboration with higher education could include continued study of mathematics, support by experienced teachers of prospective teachers, or engagement in classroom-based research. Teachers from different schools can work together to coordinate district mathematics programs across grades K–12. They can also collaborate through membership in professional organizations, or through participation in curriculum dissemination projects. The Council supports these activities through its publications and conferences, and through such other activities as its support of Affiliated Groups.

Whatever the specifics, certain themes will run through all effective professional development programs. First, the focus of effective programs will be on teachers' needs as they work to enhance the learning of all students, including students from groups typically underrepresented in classes beyond arithmetic, in the context of classrooms and schools and communities in which they reside. Second, effective programs will recognize that the needs of teachers evolve over time as they move from being prospective teachers to new teachers to experienced teachers. Third, programs will involve teachers themselves in the identification of these needs and in the design and conduct of professional development programs. Fourth, programs will be shaped by the most current knowledge of effective practice and ways to achieve it, and will also contribute to that knowledge. Finally, effective programs will recognize that meaningful engagement by teachers in sustained professional development requires adequate long-term financial and structural support.

Responsibility for the continued transformation of school mathematics rests, ultimately, with classroom teachers. To shoulder the responsibility teachers must have access to ongoing, current, carefully and creatively designed professional development opportunities. The Council supports the growth of mathematics teachers by providing a range of professional development opportunities, developing and updating standards for the quality of these opportunities, and furthering professional development efforts through dissemination of effective models. The Council also encourages and supports the professional development opportunities provided by schools, districts, higher education, and other professional organizations. (September 1996)

Research in Mathematics Education

Significant improvements in the teaching and learning of mathematics result from the systematic development of research-based knowledge. Such knowledge is relevant to the needs of all persons associated with mathematics education. For example, research that investigates classroom practices benefits students and teachers. Research that suggests directions for programs and policy decisions provides guidance to administrators, supervisors, and curriculum developers. Research that promotes understanding of teacher development benefits teacher educators and preservice teachers. Research that clarifies our understanding of basic learning principles benefits everyone.

Classroom teachers, supervisors, mathematicians, teacher educators, and curriculum developers can all play important roles in the research process. For example, classroom teachers can identify pertinent issues for research and contribute to their investigation; mathematics supervisors and teacher educators can communicate research findings to inservice and preservice teachers; and curriculum developers can implement research findings in the preparation of student and teacher instructional materials.

Gains in research-based knowledge are made when mathematics educators are aware of pertinent research in other disciplines and collaborate with researchers in these disciplines. But, it is the mathematics educators themselves, trained in the content of mathematics and methods of teaching it, who must assume leadership roles in conceptualizing, communicating, and implementing research related to mathematics instruction.

The National Council of Teachers of Mathematics (NCTM) affirms the central role of research in the teaching and learning of mathematics. NCTM therefore supports research in mathematics education and promotes efforts to communicate the findings and implications of such research. Furthermore, NCTM encourages all mathematics educators to be involved in activities related to research. (September 1998)

Teaching Mathematics in the Middle Grades

The National Council of Teachers of Mathematics advocates that all middle-grade teachers of mathematics have extensive preparation in mathematics and its pedagogy. The new vision of school mathematics and mathematics teaching presented in the *Curriculum and Evaluation Standards for School Mathematics* and the *Professional Standards for Teaching Mathematics* requires that mathematics teachers be responsible for

- selecting and developing worthwhile mathematical tasks;
- managing, enhancing, and promoting discourse in the classroom;
- creating a learning environment that fosters students' confidence in their own ability and skill in problem solving, communicating with and about mathematics, and reasoning;
- engaging in ongoing analysis of teaching and learning;
- accommodating the characteristics and needs of young adolescents;
- working with other teachers as a team to develop interdisciplinary and developmentally appropriate mathematics programs;
- modifying the mathematics curriculum to motivate and nurture students with different abilities and learning styles;
- interacting sensitively with students and parents from diverse racial and cultural backgrounds.

The NCTM believes that every student has the right to a mathematics education that ensures that he or she achieves mathematical literacy and develops the concepts, skills, and dispositions necessary for a meaningful and productive life. Middle-grade students in particular are at a critical stage when the attitude they develop toward mathematics can have a significant impact on their chances for success in high school mathematics and on their life choices. It is therefore essential that mathematics teaching in the middle grades help students experience mathematics as a personally meaningful and worthwhile

endeavor. Furthermore, students should see mathematics as a powerful and useful tool in their lives, in their pursuit of knowledge in other subject areas, and in their careers.

If we are to reach these student goals, teachers of middle-grade mathematics should have high-quality preparation in mathematics and mathematical pedagogy as outlined in the "Professional Development of Teachers" section of the *Professional Standards for Teaching Mathematics*. Schools have a responsibility to assure through their hiring and professional development practices that children's mathematical experiences are with teachers who possess the knowledge and characteristics described therein.

Teacher education and mathematics faculties must align their teacher preparation and professional development programs with these Standards. Certification options available through state and provincial departments of education should include middle-grade mathematics. Schools, school districts, colleges, universities, and provincial or state licensing agencies are encouraged to collaborate in designing and implementing undergraduate, in-service, and graduate programs that will enable middle-grade teachers of mathematics to teach for the present and future demands of society in accordance with the developmental needs of the students. (March 1992)

The Use of Technology in the Learning and Teaching of Mathematics

Technology is changing the ways in which mathematics is used and is driving the creation of new fields of mathematical study. Consequently, the content of mathematics programs and the methods by which mathematics is taught and learning assessed are changing. The ability of teachers to use the tools of technology to develop, enhance, and expand students' understanding of mathematics is crucial. These tools include computers, appropriate calculators (scientific, graphing, programmable, etc.), videodisks, CD-ROM, telecommunications networks by which to access and share real-time data, and other emerging educational technologies. Exploration of the perspectives these tools provide on a wide variety of topics is required by teachers.

It is the position of the National Council of Teachers of Mathematics that the use of the tools of technology is integral to the learning and teaching of mathematics. Continual improvement is needed in mathematics curricula, instructional and assessment methods, access to hardware and software, and teacher education.

- Although the nature of mathematics and societal needs are forces that drive the curriculum, the opportunities that technology presents must be reflected in the content of school mathematics. Curricular revisions allow for the de-emphasis of topics that are no longer important, the addition of topics that have acquired new importance, and the retention of topics that remain important. In the implementation of revised curricula, time and emphasis are to be allocated to the topics according to their importance in an age of increased access to technology. Instructional materials that capitalize on the power of technology must be given a high priority in their development and implementation. The thoughtful and creative use of technology can greatly improve both the quality of the curriculum and the quality of students' learning.
- Teachers should plan for students' use of technology in both learning and doing mathematics. A development of ideas is to be made with the transition from concrete experiences to abstract mathematical ideas, focusing on the exploration and discovery of new mathematical concepts and problem-solving processes. Students are to learn how to use technology as a tool for processing information, visualizing and solving problems, exploring and testing conjectures, accessing data, and verifying their solutions. Students' ability to recognize when and how to use technology effectively is dependent on their continued study of appropriate mathematics content. In a mathematics setting, technology must be an instructional tool that is integrated into daily teaching practices, including the assessment of what students know and are able to do. In a mathematics class, technology ought not be the object of instruction.
- Every student is to have access to a calculator appropriate to his or her level. Every classroom where mathematics is taught should have at least one computer for demonstrations, data acquisition, and other student use at all times. Every school mathematics program should provide additional computers and other types of technology for individual, small group, and whole-class use. The involvement of teachers by school systems to develop a comprehensive plan for the ongoing acquisition, maintenance, and upgrading of computers and other emerging technology for use at all grade levels is imperative. As new technology develops, school systems must be ready to adapt to the changes and constantly upgrade the hardware, software, and curriculum to ensure that the mathematics program remains relevant and current.

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- All professional development programs for teachers of mathematics are to include opportunities for prospective and practicing teachers to learn mathematics in technology-rich environments and to study the use of current and emerging technologies. The preparation of teachers of mathematics requires the ability to design technology-integrated classroom and laboratory lessons that promote interaction among the students, technology, and the teacher. The selection, evaluation, and use of technology for a variety of activities such as simulation, the generation and analysis of data, problem solving, graphical analysis, and geometric constructions depends on the teacher. Therefore, the availability of ongoing in-service programs is necessary to help teachers take full advantage of the unique power of technology as a tool for mathematics classrooms.

The National Council of Teachers of Mathematics recommends the appropriate use of technology to enhance mathematics programs at all levels. Keeping pace with the advances in technology is a necessity for the entire mathematics community, particularly teachers who are responsible for designing day-to-day instructional experiences for students. (February 1994)

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